VOL. XII **TEXTILE RESEARCH** NO. 2

Outstanding Features in

This Month's Issue

New Research Program

With its new name and its new plan, Textile Research Institute, Inc., is all primed to launch an ambitious program. (See page 2.)

Textiles From Milk

Aralac, a synthetic fiber derived from casein, reaches commercial stage after four years of research. (See page 10.)

Cooperative Research

Fundamental and applied research carried on at the Institute of Paper Chemistry aids the pulp and paper industry. (See page 14.)

Another Lucky Accident

Heat-resistant cotton yarns and cords developed through research fill important civilian and defense needs. (See page 18.)

Fiber Identification

Microscopic and chemical tests permit identification of Nylon, Vinyon, various types of rayons, and other synthetic fibers. (See page 25.)

Fessenden S. Blanchard Outlines Textile Research Institute's

New Research Program

WITH ITS NEW NAME and its new plan, Textile Research Institute, Inc., is all primed to launch a program which will lift the textile industry from its cellar position, as regards research, up to and beyond the heights already achieved by other leading industries. That's the impression of all who attended the record-breaking annual meeting of the Institute, held Nov. 14, at the Hotel Roosevelt, New York.

The three main phases of the new program were described by Fessenden S. Blanchard, president of the Institute, as: (1) scientific and industrial research; (2) publications, publicity, and information; and (3) economic research. In carrying forward this program Textile Research Institute will work in close cooperation with the Textile Foundation. The plan as outlined was accorded an enthusiastic reception by the heads of the major textile associations, executives of textile manufacturing companies and sales agencies, deans of textile schools, and representatives of allied industries present. The change in name of the organization from United States Institute for Textile Research to Textile Research Institute, Inc., was put into effect by a unanimous vote of the members in attendance.

An abstract of Mr. Blanchard's address follows:

An important step forward was taken last spring when the Textile Foundation and the Institute agreed on a plan of close cooperation under which both organizations maintain their separate identities and yet combine

Group at speakers' table; left to right: Donald Comer, Carroll Wilson, Dr. Milton Harris, and Edward T. Pickard

their men and resources in a united effort to develop textile research—fundamental and applied, technical and economic.

The key to the whole plan was the appointment of Ed Pickard as executive secretary of both organizations. With Mr. Pickard will be associated Dr. Milton Harris, who is director of textile research for the Textile Foundation.

Acting in cooperation with the Institute's technical research committee, of which William Appel is chairman, Dr. Harris will have general supervision, not only of fundamental and applied research, but also of mill contacts involving the effective use of the results of both types of research. It is planned to develop the mill contact work into a very important segment of the whole program, with three major purposes in mind: (1) bringing to the mills the results of fundamental and applied research being conducted by the Institute, the Foundation, and others; (2) aiding members in their research activities and guiding research projects which are being undertaken under the auspices of the Institute; and (3) bringing to the laboratories a clearer understanding of the practical problems in which the mills are most interested.

The next important member of the new organization

Fessenden S. Blanchard, president of Textile Research Institute, Inc.

will be a director of publications, publicity, and information. This man has not yet been selected. At the start he will have a double job—serving as editor of TEXTILE RESEARCH, and as manager of an information service through which members may keep posted on textile research facilities, studies, and reports which are available on a wide variety of subjects. He will act in cooperation with the committee on publications, of which Douglas Woolf is chairman.

The third key man working with the president and executive secretary will eventually be a director of economic and business research. For the time being, this work will be carried on as it has been in the past, by an economic research committee, of which Stanley B. Hunt is chairman. When eventually appointed, the director will continue to act in cooperation with that committee.

What physical equipment have we to enable us to carry on our work? Thanks to the whole-hearted cooperation of Dr. Briggs, director of the National Bureau of Standards, splendid laboratory facilities are available. Other laboratories will also be available, it is hoped, some of them equipped with full-sized textile machinery like that located in the textile schools and the Government

Westbrook Steele, executive director, Institute of Paper Chemistry

laboratory at New Orleans. For larger scale tests it is hoped that arrangements can be made for the facilities of member plants in cooperative research projects. Our ultimate goal is a building of our own, with complete facilities for all types of textile research and manned by an outstanding staff in which scientific and practical mill knowledge will be combined.

We have spent months, through personal contacts and written requests, in endeavoring to find out in what research projects the industry is most interested. Replies to our inquiries have been pouring in, and Mr. Appel and his technical research committee, aided by Dr. Harris, have been busy analyzing and classifying them in an endeavor to sort out what seem the more important. We are planning to lay out a research program for several years ahead, and then undertake the projects as fast as time and money permit.

An important part of our new plan will be the setup of regional or commodity groups of members in leading centers of textile interest. This, combined with more frequent general meetings, will result in far more productive cooperation and interest in research activities.

Here is the most important point: The reason I can

say to you that a broad-gaged textile research program is in the making is the pooling of resources of the Institute and the Foundation. The latter organization has announced its intention of self-liquidation after a certain number of years. It is up to the industry itself to develop its own program as a follow-through to the Foundation's marvelous job of the last decade.

But don't expect the impossible in the next year. None of us who have been engaged in shaping the plan to date want to build a building or install equipment, or plan a research project, merely for the sake of doing something. We want every step of the program to represent a step taken by the industry, rather than by your executive committee. That is why it is so vital that we have the cooperation of all textile associations, all companies, and all individuals engaged in the various branches of the industry. There is a great deal that can be done, and we shall need advice and support from the entire industry in all its branches, to convert our plans into achievements of which we shall all be proud.

Other Speakers

Other speakers at the meeting included Rear Admiral H. G. Bowen, who described the work of the Naval Research Laboratories; Dr. Milton Harris, director of scientific research for the Institute and the Textile Foundation, who spoke on fundamental research; and Westbrook Steele, executive director of the Institute of Paper Chemistry, who discussed the research activities of his organization.

The following officers of the Institute were reelected: F. S. Blanchard, president; Dr. R. E. Rose and Fuller E. Callaway, Jr., vice-presidents; Dr. Harold DeWitt Smith, treasurer; and Edward T. Pickard, executive secretary. The new executive committee was announced as comprising, under the revised by-laws, the officers and the chairmen of the standing committees: William Appel, Stanley B. Hunt, Douglas G. Woolf, and the chairman of the membership committee, to be appointed.

RESEARCH ACTIVITIES

Fessenden S. Blanchard, president of the Institute, who has been associated with Pacific Mills since 1913, in charge of public relations, market research, promotion, and personnel, has been appointed textile consultant in the Bureau of Industrial Conservation of OPM in Washington.

Penetration of glue and gelatin sizes in spun-rayon yarns is discussed in confidential report No. 4 issued to those cooperating in the research on warp sizing being conducted by Textile Research Institute, Inc.

To safeguard against debasement of any developments in production of cotton goods resulting from research work of the Shirley Institute (England), the Institute and the Cotton Board (Manchester, England) have jointly applied for registration of a certification trade mark. British textile manufacturers will be granted the right to apply this trade mark to cotton goods produced according to Shirley Institute specifications.

Albert C. Walker, chairman of the Institute's drying research committee, was one of the principal speakers at the annual meeting of the Textile Division of the American Society of Mechanical Engineers, held Dec. 3 in New York. Mr. Walker discussed the upper limits of temperature and humidity for fibers in drying operations.

Scientific measurements of the length, fineness and strength of cotton fibers are offered on a fee basis to cotton breeders, producers, and manufacturers through a new cotton testing service inaugurated by

the University of Tennessee Fiber Research Laboratory, at Knoxville, Tenn. Employing new fiber-testing instruments, two of them developed by a University of Tennessee professor, the service will furnish speedy measurements expressed in figures which are easily understood.

Winner of first prize for papers presented in the intersectional contest at the annual meeting of the American Association of Textile Chemists & Colorists, held recently in Pinehurst, N. C. was a report made by the Rhode Island Section of results of a cooperative research on the relation between the construction of cotton fabrics and their water resistance. The investigation involved study of more than 50 constructions of cotton fabrics mill treated under controlled conditions with two types of water repellents.

Recognition of the importance of research to the defense program and to the public at large was given in an OPM order granting the high priority rating of A–2 to equipment needed by research laboratories (Textile Research, November, 1941). In a move to broaden the assistance to research laboratories, OPM last month issued a further order assigning a preference rating of A–5 to facilitate acquisition of scarce materials by manufacturers of chemicals and equipment required by the laboratories.

"Current economic conditions, as well as long-term trends, are giving a powerful stimulus to industrial research," stated Maurice Holland, director of the National Research Council's division of engineering and industrial research at a recent meeting of the Industrial Research Institute, held in Detroit. An im-

promptu poll of the group, which is a representative cross-section of 2,300 industrial research laboratories in the United States, disclosed that in 1942 all plan either to maintain or to increase their present rate of their research activities.

A symposium on use of statistical methods in testing was a feature of the fall meeting of Committee D–13 of the American Society for Testing Materials, held in New York. Speakers and subjects discussed were: A. E. Brandt, Soil Conservation Service, U. S. Dept. of Agriculture, "Engineering Use of Statistical Techniques in Testing"; A. G. Scroggie, E. I. du Pont de Nemours & Co., Inc., "Statistical Methods for Determining Number of Tests for Strength and Elongation of Rayon Yarns"; and Lillian Weidenhammer, Bureau of Home Economics, U. S. Dept. of Agriculture, "Application of the Recommended Practice in the Selection of a Chemical Test Method and in Determining its Precision."

A new laboratory for testing the mildew-proofness of cotton sand bags has been set up recently at the National Bureau of Standards. This work was formerly carried out by the U. S. Department of Agriculture, but the job of testing sand bags for the Army is so big and the demand for speed so great that, to expedite the work, the Bureau will conduct all tests. The Department of Agriculture, however, will continue its research on mildew-proofing agents.

American Viscose Corp. has recently installed standard Bradford drawing and spinning equipment for experimental production of worsted-type spun rayon yarns in its Textile Unit, at Marcus Hook, Pa.

Successful Researches on Casein Lead to Process for Making

Textiles From Milk

IT IS POSSIBLE to make a silk purse from a sow's ear. But it isn't being done commercially. It is possible also to make textiles out of a bottle of milk. And on a scale and at a price that is commercially practicable. National Dairy Products Corp., 230 Park Ave., New York, announced a little over four weeks ago successful processing of a new textile fiber, known as Aralac, the raw material for which is casein obtained from skim milk. The material is the result of four years' study, laboratory work, and experimentation.

Aralac, which is described as a protein fiber of the prolon family, is said to impart distinctive characteristics to fabrics in which it is used. It can be blended, the manufacturers state, with wool, mohair, cotton, rayon, or fur, in varying proportions. It is more expensive than rayon and cotton; less costly than fur and wool. Aralac is said to supply drape and substance which previously could be obtained only through the use of fur and wool in some fabrics. Fabrics of unusual beauty are cited as resulting from blends of Aralac with rayon.

Exhaustive Tests Made

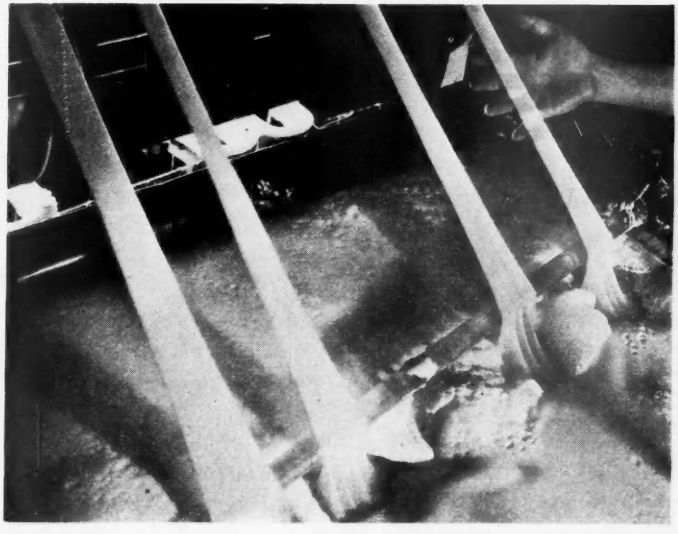
Results of exhaustive tests for resiliency, tensile strength, abrasion, odor, affinity to dyes, and ability to withstand dry cleaning and washing, are said to have proved the new fiber satisfactory for use by textile mills in the manufacture of a variety of fabrics.

Much of the credit for Aralac goes to Atlantic Research Associates, Inc., Newtonville, Mass., a scientific

research division of National Dairy. In recognition, the initials of that organization were used to form the first syllable in the name of the fiber. National Dairy began actively to investigate the possibility of producing fiber from casein in 1937. Atlantic Research Associates were commissioned to make experiments. Under the direction of Francis Clark Atwood, president of ARA, who had previously conducted research for some years on casein fiber, a staff of scientists and technicians worked for months in the laboratory. This was followed by experimental manufacture; and, in turn, by full-scale production.

Production of fibers from milk is not new. As far back as late in the last century—even before rayon was developed—scientists were experimenting with casein fiber. Considerable interest was evinced in Lanital, an Italian-developed casein fiber announced late in 1935. This material, produced by a process devised by Com. Antonio Ferretti, was said closely to approximate wool

Thousands of fibers made from milk emerge from four spinnerets of this casein-fiber spinning box



in its chemical constitution. Plans were set up for its importation into this country, but, because of the war and accompanying changes in Italy's domestic economy, these plans were abandoned.

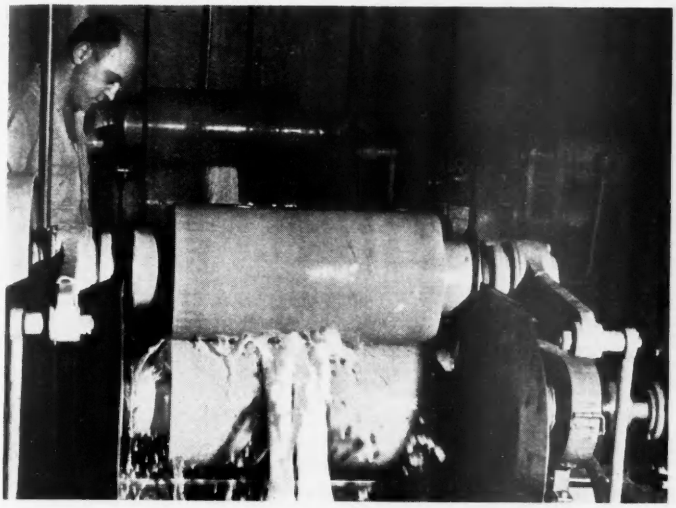
Process Employed

Aralac is said to be the first milk-derived fiber acceptable to the American textile industry, and available in commercial quantities. Production of Aralac begins with separation from skim milk of its casein content, approximately 3% of the total volume. The method consists, in general, of raising the temperature of skim milk to from 95 to 118° F., adding acid, and separating the whey, or liquid portion. Careful washing removes excess acid and salts. Then as much water as possible is removed by pressure. The casein is broken into particles the size of rice or smaller and dried quickly.

In manufacture of Aralac fibers, after the casein has been extracted from milk, dried, and ground, it is treated with chemicals and heated into a viscous, honey-like form. Forced through spinnerets under hydrostatic pressure, the emulsion emerges as thousands of strands of fiber, called "wet tow."

Next, the tow is passed through a number of chemical baths designed to soften it and impart a luxurious hand. The fibers then are placed in centrifugal extractors, by means of which processing chemicals are removed and recovered for re-use. Washing follows, then drying. The material is now ready for cutting into lengths suitable for processing on textile machinery. A staple-fiber cutter of conventional design is used for this purpose.

Aralac is made at Taftville, Conn., by Aralac, Inc., a special manufacturing division established by National Dairy for that purpose. Present production capacity is about 5,000,000 lb. a year—the recoverable casein content of about 160,000,000 lb. of skim milk. The factory has been operating on a 24-hour basis for about five months, following more than two years' pilot-plant operation at Bristol, R. I. What this may mean to the dairy industry



Washing, to remove all traces of chemicals, is an important part of production of Aralac casein fibers

is equally as important as what it may mean to the textile industry. Dairymen have long been concerned because despite increased use of casein in paper-coating, paints, plastics, etc., these applications provide commercial outlets for only about 20% of the nation's skim milk.

Uses for Fiber

The felt-hat industry was the first to use Aralac. In 1940, many fur-felt hats contained the milk-derived fiber; today most fur-felt and wool-felt hats in the United States, Canada, and South America are made in part from casein fiber.

Fabric manufacturers, too, are using Aralac in a variety of cloths. Dress fabrics, in which casein fibers are blended with rayon, wool, or other material, are so far leading in volume. Bed blankets, neckties, and men's suitings containing a percentage of Aralac fibers are also being produced. In Canada, heavy underwear fabrics are being made of Aralac blended with wool. Numerous other uses of the material are expected to be developed.

Technical Progress in Paper Industry Aided by

Cooperative Research

By WESTBROOK STEELE

Executive Director, Institute of Paper Chemistry

THE PROGRAM of the Institute of Paper Chemistry, Appleton, Wis., as laid down in 1929, the date of its founding, was a three-fold one: (1) education of manpower specifically for the paper industry at the graduate level; (2) establishment of a library with the ultimate aim of gathering all the scientific literature pertaining to pulp and paper, its chemistry and processes; and (3) prosecution of scientific research in the fundamental problems of the pulp and paper industry. The Institute was formed by the chief executives of 19 paper mills located in the State of Wisconsin. By its charter, it was affiliated with Lawrence College for academic purposes, and was, in fact, one of the first cooperative movements between education and industry.

Five Kinds of Research

There are five kinds of research carried on at the Institute, all intended to be of service to the paper industry: (1) fundamental research including the specific staff research projects initiated to provide a background for a foundation for broader investigation; (2) scientific researches carried on by the students as Masters' theses or Doctors' dissertations; (3) research on general problems which should be of interest and ultimate benefit to the paper industry as a whole; (4) research of a confidential nature on specific problems presented to the

Institute staff by an individual member mill or by a group of members; and (5) research of a confidential nature on specific problems presented by an allied industry; that is, one supplying materials or equipment to the paper industry.

From the results of the first three classes of research named above, 125 patent applications have been filed and 55 already allowed. All patents developed in these classes belong to the Institute and through it to its membership. Findings from the fourth and fifth classes, above, whether patentable or not, belong solely to the company or group of companies financing the research projects.

The Institute has an endowment to maintain and operate its library buildings and also an endowment, the income from which supports some scholarship aid to its students. Aside from this, however, its entire support comes from the paper industry and its allies. The budget for 1929–30 was $40,000; this year it will be in excess of $430,000. Its original contributions were received from 19 mills all confined to one State; it is now expanded to include contributions from 70 concerns, representing approximately 170 paper and pulp mills throughout the United States. These mills manufacture 60% of the total

Two of three new buildings of the Institute of Paper Chemistry

domestic production of pulp, newsprint, paper, and board.

The Institute's equipment represents an investment of approximately $1,250,000 and is housed in three new buildings, and two frame buildings.

The problem of recruiting students has reduced itself to a problem of selection. Almost from the beginning we have had an over-abundance of qualified applicants. We have admitted 15 students each fall, selected from no less than 200.

The library is reputed to be the finest in the field in the country. Naturally it is sheer waste to conduct research along paths beaten hard by previous travelers; consequently the Institute has library searches preceding every investigation. A valuable service is performed by the publication of a monthly library bulletin containing abstracts of the most important articles appearing in periodicals relevant to the industry.

Results Achieved

As to the results of the first 12 years of the Institute's existence, the record of its graduates who are out in industry justifies the statement that it is satisfactorily fulfilling its major function, the training of man-power for the paper industry. By its accomplishments in the field of fundamental research it has proved that through such an institution the huge cost of necessary research in the fundamental problems of the industry can be shared, and results achieved within the space of a reasonable time which would be impossible through individual effort. In the field of specific research for member mills about 800 projects have been handled.

The effectiveness of the partnership between education and industry as represented by the Institute has been clearly demonstrated. It is an economical and effective means to develop trained man-power, to discover fundamental facts.

(Abstract of a paper presented at the Annual meeting of Textile Research Institute, Inc., Nov. 14, in New York.)

Your Help Is Needed

AN EDITORIAL

• The aims of Textile Research Institute, Inc., are to promote, cultivate, facilitate, and conduct textile research. The purpose of the Institute's official publication, TEXTILE RESEARCH, is to further those aims.

• That the revitalized TEXTILE RESEARCH can be a potent force is evidenced by the enthusiastic reception accorded the November issue. But it must have the active support of every member of the Institute if it is to grow in strength and vigor.

• In planning the November and December issues of TEXTILE RESEARCH, the publications committee and the acting editor have endeavored to anticipate the desires of the readers. Included in these two issues are articles demonstrating how individual companies in the textile and allied industries have profited from research, articles translating research reports into the mill man's language, articles describing new research methods. Included also are two new departments—one on research activities and one on research aids.

• But it's *your* publication; and from now on *your* help help is needed. First, we want your suggestions as to further changes and improvements in content and format. Second, we invite you to submit feature articles on any phase of textile research. Third, we urge you every month to send in brief items on current activities of individuals or organizations engaged in textile research.

• Kindly address all contributions to: Editor, TEXTILE RESEARCH, Room 3701, 10 East 40th St., New York.

Heat-Resistant Cotton Cord Was Born of Research, But Called

Another Lucky Accident

MOST OF US CAN REMEMBER the time when an automobile tire that lasted for more than 3,500 miles was a marvel. Today there are tires still giving service after running 200,000 miles. Among the principal reasons for this longer tire life are the improvements which have been made in recent years in tire cords. And outstanding among these improvements is the development by Bibb Mfg. Co., of heat-resistant cotton cords. Widely employed in manufacture of heavy-duty tires for trucks and buses, in transmission belts, and in hydraulic brake hose, Bibb H.R. processed yarns are now beginning to be used by the U. S. Army Air Corps in webbings for parachute harnesses, bomb slings, and other items formerly made from linen. Like many other notable inventions, the process for producing heat-resistant cords was the result of long and painstaking research.

Early Developments

At first square woven duck made from Sea Island cotton was used in the manufacture of tires. Then, about 25 years ago, tire manufacturers began to experiment with cotton cords, instead of woven fabrics, in tire construction. Such tires gave better service, but many of them literally burst open from the shock of striking stones, holes, and ruts in the unpaved roads common at that time. This problem was largely overcome by imparting high twist and otherwise modifying the construction of the cords so as to make them more elastic.

Then came paved roads, and heavy trucks and busses

capable of traveling at high speeds. The elastic cords, which had proved satisfactory on rough, rocky roads, were now a liability. Heavy loads stretched the cords beyond their elastic limit, forcing the strain onto the rubber which the cords were intended to reinforce. The fibers slipped, thus contributing to the lengthening of the cords, and the tires swelled. Again, the looseness of the fibers permitted them to rub together and generate heat as the cords flexed with every revolution of the wheel. Tread cracks, tire growth, separation of rubber from the cords, and blow-outs were all too frequent.

Low-Stretch Cords

Elimination of excessive stretch appeared to be the first essential in the improvement of cords to meet the new conditions, and this was accomplished by de-stretching conventional cords to produce the type known commonly as "low-stretch" cords. It was found that low-stretch cords produced better tires for high-speed, heavy-duty service than could be obtained with high-stretch cords. It was learned also that a cord of low gage and high density aided further in production of better tires;

View in laboratory of Columbus plant of Bibb Mfg. Co. where much of development work on the H.R. process was carried out

however, the research workers at Bibb Mfg. Co. were not satisfied. They believed that Enemies Nos. 1 and 2 of tires are the heat that is generated in the tire when it is operated under heavy loads and high speeds, and the growth of the tire in service. They reasoned that if these two enemies could be overcome, tire life would be greatly prolonged. Accordingly, they applied themselves to the problem of finding out how to produce a cord which would resist the generation of heat in the tire and which would hold the growth of the tire to a minimum.

Countless Experiments

Countless series of experiments and tests were carried out along many different lines. Then one day, through what the Bibb Mfg. Co. modestly calls "another lucky accident," it was discovered that cords treated by a particular method possessed a bone-dry strength which was substantially equal to their strength under normal moisture conditions. Such a result was contrary to all theory and experience. Cotton cords had always been about 22% weaker in a bone-dry condition. The experiment was repeated, and the results were the same. The answer was that in this particular process the fibers were bonded together by softening the natural gums in the cotton fibers and then keeping the cord under tension and compression until the gums had set.

Commercial Process Developed

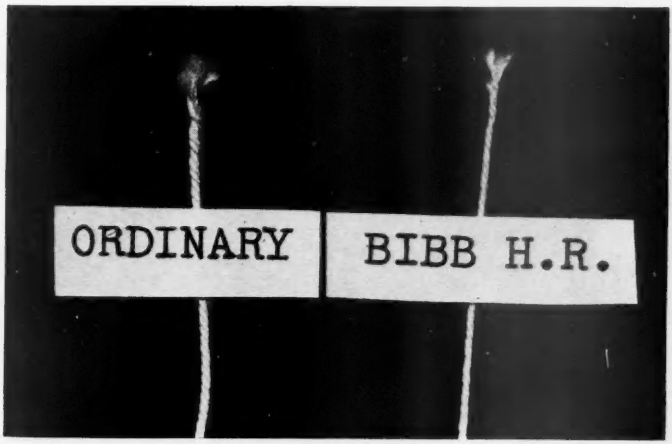
The next step was the development of a commercially practicable method for achieving similar results. Further research work and mill trials finally resulted in the process for producing heat-resistant cotton yarns and cords protected by U. S. Patent No. 2,103,218. Among the properties of this cord which account for its popularity for use in automobile tires, transmission belting, and hydraulic brake hose, and which are now making it important in the national defense program, are: high tensile strength under both normal and bone-dry conditions of moisture; ability to withstand flexing; low gage and high density; lack of fiber slippage, which solves the growth

problem in tires; and lack of friction between elements comprising the cord, which minimizes generation of heat.

The Bibb organization is justifiably proud of the development of H.R. cord; but it is not complacent—it still it not satisfied that the present high-twist cord is the ultimate construction. William D. Anderson, chairman of the board of the company, says: "The chances are that before long we will find that a lower twist cord, in which the fibers are not so tortured by excessive tension, will do better." Through research, the company is always striving to improve its present products and discover new ones.

At the Columbus plant is a laboratory equipped with instruments to explore fiber characteristics, as well as with special machinery for making test runs on promising developments. This is quite aside from control laboratories which are a part of each plant. But research is not confined to the Columbus laboratory, and many of Bibb's most valuable discoveries have come directly out of the plants, rather than from the laboratory.

Cord ends after being broken; note that many fibers in the ordinary cord slipped, whereas relatively few fibers in the H.R. cord slipped



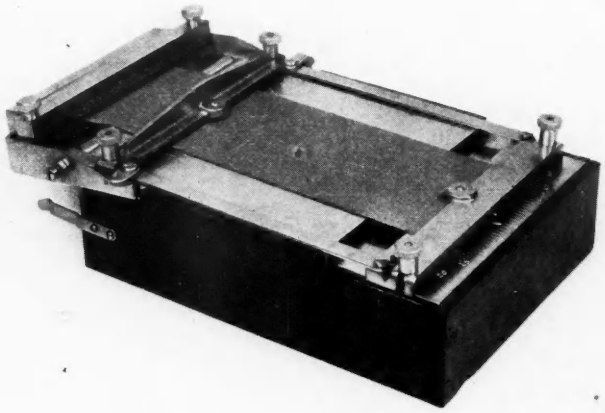
RESEARCH AIDS

Device Evaluates Fabric Pliability

Evaluation of the pliability of woven fabrics is facilitated by development of a simple device said to be more sensitive than the human hand. Results obtained with the new instrument, which is known as the Planoflex, are said to show better correlation with hand pliability tests than do results obtained with other mechanical methods. The Planoflex gives measurable values on all woven fabrics, except those which are so heavily starched that the warp and filling yarns are cemented together. It is not suitable, however, for testing knitted fabrics. The sensitiveness of the instrument to slight differences in pliability makes it suitable for comparing quantitatively the effects obtained by different finishing agents.

The Planoflex with specimen in position ready for test is shown in the accompanying illustration. The specimen is 3 inches wide and 10 inches long. One end

Planoflex



is fastened centrally in the weight clamp to the left of the photograph, and the other end in the movable clamp to the right. The weight clamp is mounted on a hinged shelf which is then lowered, thus applying a load of 2 pounds lengthwise of the specimen. The fixed or middle clamp is then tightened. By shifting of the movable clamp to the right and to the left, the cloth is distorted in its own plane until longitudinal wrinkles just appear on its surface. The total angle of displacement of the movable clamp relative to the fixed clamp to which it is connected by two metal strips is read from the scale at the front of the instrument. This angle is a measure of the pliability of the fabric.

The Planoflex was developed by the National Bureau of Standards, Washington, D. C., in cooperation with the American Society for Testing Materials.

Textile Standards and Tests

A must for every textile research and testing laboratory is the 1941 edition of "A. S. T. M. Standards on Textile Materials." * This book contains all the specifications, definitions, tolerances, and tests pertaining to textiles adopted by Committee D13 of the American Society for Testing Materials. Among other data included are photomicrographs of common textile fibers, yarn-number conversion table, psychometric table for relative humidity, glossary of textile terms with two supplements—one covering defects in woven fabrics and the other giving terms relating to hand of fabrics.

* A. S. T. M. STANDARDS ON TEXTILE MATERIALS, *American Society for Testing Materials, Philadelphia; $2.*

Official Test Methods

Another must for research and testing laboratories is the "1941 Year Book of the American Association of Textile Chemists & Colorists." * Contents include: (1) the as-

sociation's official methods for determining fastness of dyed and printed textiles, water resistance of fabrics, resistance of textiles to insect pests, etc.; (2) analytical methods for the textile laboratory; (3) list of American-made dyes; (4) list of textile chemical specialties; and (5) bibliography of books and articles on textile chemistry and processing.

* 1941 YEAR BOOK OF THE AMERICAN ASSOCIATION OF TEXTILE CHEMISTS & COLORISTS; *American Association of Textile Chemists & Colorists, Lowell Textile Institute, Lowell, Mass.; $3.50.*

Carother's Contribution

Researches leading to development of Nylon and other new synthetic organic chemicals of growing industrial importance are discussed in the "Collected Papers of Wallace H. Carothers on Polymerization."* The book should be in the library of every textile research chemist; on the desk of every textile mill executive. To the research worker, it will be of value not only because of the scientific data it contains, but as an inspiration to keep plugging when the outlook is dark. To the executive, it should be a constant reminder that research pays dividends.

* COLLECTED PAPERS OF WALLACE H. CAROTHERS ON POLYMERIZATION; *Edited by H. Mark and G. S. Whitby; Interscience Publishers, Inc., New York; $8.50.*

What You Should Know About pH

Booklet, "What Every Executive Should Know About pH," explains what pH is, how pH is measured, and how pH control is used in bleaching and dyeing of textiles and other applications. Booklet can be obtained gratis from National Technical Laboratories, South Pasadena, Cal.

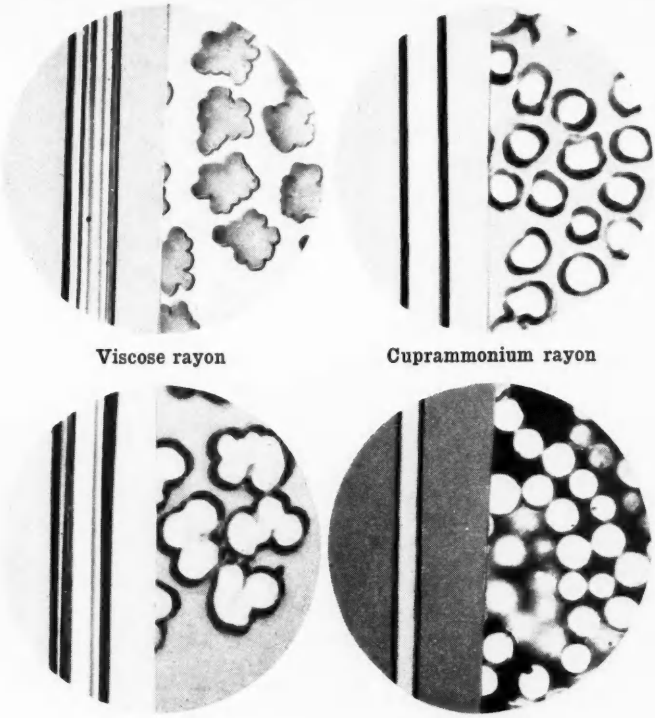
Growing Use of the Synthetics Calls for New Methods of

Fiber Identification

NEED FOR STANDARD METHODS of fiber identification is well recognized by textile men. Considerable work has been done toward development of such methods by Committee D13 of the American Society for Testing Materials and by the A. A. T. C. C. The latest methods proposed by these two organizations are described in "A. S. T. M. Standards on Textile Materials" and in the "1941 Year Book of the American Association of Textile Chemists & Colorists." Still lacking, however, are standard methods for identifying Nylon, Vinyon, casein fibers, soy bean fibers, and glass fibers, and for distinguishing these fibers from rayon and from natural fibers.

Suggested methods for the identification of various types of synthetic fibers (including rayons) are presented in this article. It is believed that in their present form they will be a useful supplement to either the A. S. T. M. or the A. A. T. C. C. methods. Further, it should be possible to incorporate them, in whole or in part, in a more comprehensive system for identification of both natural and synthetic fibers.

There is general agreement that success in identification of textile fibers calls for use of the microscope in combination with other tests. That is, chemical or staining tests should be confirmed by examination of the fibers under the microscope, and vice versa. The system of analysis suggested in this article has been compiled from various sources. Some of the tests included are well known; others are comparatively new and are not yet in



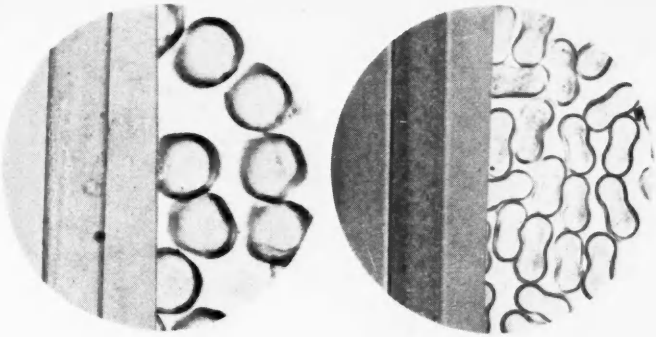
Viscose rayon

Cuprammonium rayon

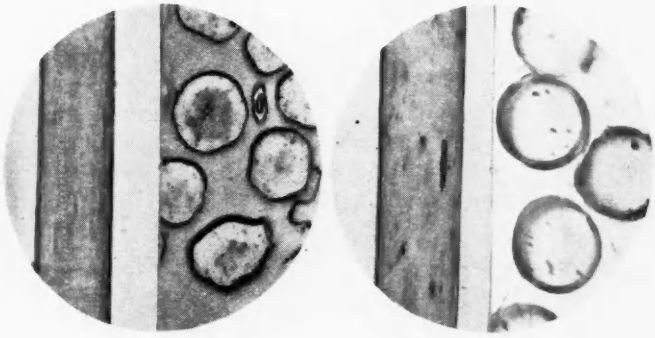
Acetate rayon

Fiberglas

general use. The author wishes to express his gratitude to the Wm. M. Grosvenor Laboratories, Inc., 50 East 41st St., New York, for checking the adequacy of certain of the newer tests. This laboratory also prepared all the photomicrographs used in this article. The photomicrographs show the longitudinal and cross-sectional appearance under the microscope (magnification 500 ×) of viscose rayon, cuprammonium rayon, acetate rayon, Fiberglas, Nylon, Vinyon, casein fiber, and soy bean fiber. The chart on page 28 outlines the chemical and staining tests for identifying these fibers. Before proceeding with the tests, one must first ascertain by examination under the microscope, or by other methods, that the sample is not



Nylon Vinyon



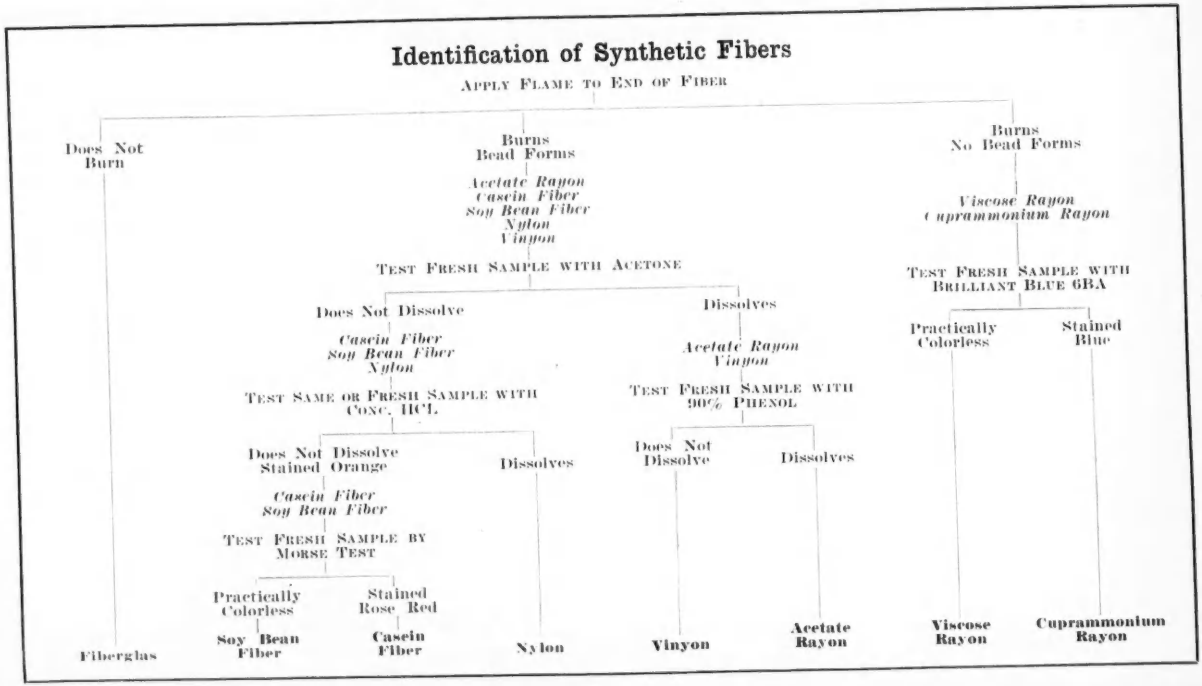
Casein fibers Soy bean fibers

composed of cotton, wool, silk, asbestos, or other natural fibers.

Following is a description of the tests:

Ignite sample: Apply flame to end of single fiber. Failure of fiber to burn indicates it is Fiberglas. If fiber burns and bead forms, it may be acetate rayon (acetic acid odor); casein fiber or soy bean fiber (burnt hair odor); Nylon (amide odor, round hard bead); or Vinyon (paraffin wax odor, fiber shrinks from flame). If fiber burns but no bead forms, it may be viscose rayon or cupramonium rayon.

Acetone test: Agitate fresh sample of fibers vigorously for 15 minutes at room temperature in about 50


Identification of Synthetic Fibers
Apply Flame to End of Fiber
Does Not Burn
Fiberglas
Burns
Bead Forms
Acetate Rayon
Casein Fiber
Soy Bean Fiber
Nylon
Vinyon
Test Fresh Sample with Acetone
Does Not Dissolve
Casein Fiber
Soy Bean Fiber
Nylon
Test Same or Fresh Sample with Conc. HCL
Does Not Dissolve
Stained Orange
Casein Fiber
Soy Bean Fiber
Test Fresh Sample by Morse Test
Practically Colorless
Soy Bean Fiber
Stained Rose Red
Casein Fiber
Dissolves
Nylon
Dissolves
Acetate Rayon
Vinyon
Test Fresh Sample with 90% Phenol
Does Not Dissolve
Vinyon
Dissolves
Acetate Rayon
Burns
No Bead Forms
Viscose Rayon
Cuprammonium Rayon
Test Fresh Sample with Brilliant Blue GBA
Practically Colorless
Viscose Rayon
Stained Blue
Cuprammonium Rayon

times its weight of acetone. If fibers dissolve, they may be acetate rayon or Vinyon. If fibers do not dissolve, they may be casein fiber, soy bean fiber, or Nylon. (See A. S. M. E. method for further details.)

Phenol test: Agitate fresh sample of fibers for about 15 minutes at room temperature in about 50 times its weight of a 90% phenol solution. If fibers dissolve, it indicates they are acetate rayon. If fibers do not dissolve, it indicates they are Vinyon.

Hydrochloric acid test: Agitate fresh sample of fibers (or residue from acetone test) for 5 minutes at 30 to 40° C. in about 50 times its weight of concentrated hydrochloric acid. If fibers dissolve, it indicates they are Nylon. If fibers are stained orange but do not dissolve, they may be casein fibers or soy bean fibers.

Morse test: Treat fresh sample of fibers until partially dissolved in 18% sodium hydroxide. To approximately 1 cc. of solution add 4 drops of iso-amyl alcohol and 15 drops of 30% hydrogen peroxide. Mix well and heat over a steam bath until foaming has subsided and most of the alcohol and water have evaporated. Add 2 cc. of 5N hydrochloric acid and reheat on steam bath for 10 to 15 minutes and observe color. Casein fibers turn rose red. Soy bean fibers remain colorless. (When partially dissolved, the fibers disintegrate into a cheese-like floc; a small piece of this floc may be used for the test; the solution tested be very highly concentrated with respect to the amount of fibrous material. The hydrogen peroxide should be kept on ice and used cold.)

Brilliant Blue 6BA: Treat fresh sample of fibers for 3 minutes at room temperature in a 0.2% aqueous solution of Brilliant Blue 6BA. Rinse for 5 minutes in warm water at 50 to 60° C. Viscose rayon remains practically colorless; cuprammonium rayon is stained blue.

Supplementary Tests: The so-called universal indicators are useful for making preliminary or corroboratory tests. One of these, Colotex B, is distributed by Neuberg Chemical Corp., 441 Lexington Ave., New York.

RESEARCH BRIEFS

● PRODUCTION OF IMPERMEABLE FABRICS by coating and other methods is discussed from a scientific viewpoint by C. L. Wall in an article "Production of Difficulty Permeable Fabrics," in the October, 1941, issue of the *Textile Manufacturer*. The article considers the properties of various coating and cementing agents, the effect of strains on laminated fabrics, and other factors concerning which little information has been published previously.

● FOR TESTING THE WARMTH of fabrics, a new method which takes into account drafts, humidity of air and fabric, and closeness of fit, is described by W. Howard Rees, of the British Cotton Industry Research Association, in an article "Transmission of Heat Through Textile Fabrics," in the October, 1941, issue of the *Textile Manufacturer*.

● RELATIVE MERITS of three methods for determining tensile strength of fabrics are considered by P. Larose, in an article "The Breaking Strength of Fabrics," in the September, 1941, issue of the *Journal of the Textile Institute*.

● TESTS on certain spun-rayon, rayon-wool, and all-wool fabrics indicated that the rayon and mixed fabrics have a much higher tensile strength than the wool fabrics, according to a research report, "Comparison of Some Physical Properties Affecting the Serviceability of Certain Wool, Rayon and Wool and Rayon Mixed Fabrics," by Hazel Fletcher, Mary C. Boyer, and Sister Mary Catherine Floersch, in the Sept. 15, 1941, issue of *American Dyestuff Reporter*. The mixtures were more resistant to abrasion than

either the wool or the rayon fabrics. Wool had the greatest elongation; rayon the least. The mixed fabrics shrank most during dry-cleaning. The all-wool and the mixed fabrics were similar in resistance to creasing, both being much more resistant than the all-rayon.

● PRODUCTION OF BLACK-OUT CLOTH, window-replacement fabrics, mildew-proof sand bag fabrics, and other war-time fabrics and finishes is described by R. J. Smith, of Imperial Chemical Industries, Ltd., in an article, "Textile Finishing in War Time," in the July, 1941, *Journal of the Textile Institute*. The author emphasizes that many of these war-time expediencies are capable of adaption to peace-time uses. Use of synthetic resins and cellulose ethers to produce various effects and recovery and re-use of materials are discussed. Article is of primary importance to all textile men interested in applied research and new-product development.

● COMPARISON OF RESULTS obtained by the chromate and alkali development methods of pigment dyeing is given by E. Race, F. M. Rowe, and J. B. Speakman, of the Clothworkers Research Laboratory and the Textile Chemical Laboratory of Leeds University, in two articles, "Dyeing with Mineral Khaki," in the July and August, 1941, issues of the *Journal of Society of Dyers & Colourists*. Articles are of timely interest to dyers of cotton fabrics for military use.

● HOW CATIONIC FINISHING AGENTS WORK is discussed by Robert R. Ackley, Industrial Fellow of Onyx Oil & Chemical Co., at Mellon Institute in an article "Theoretical and Practical Aspects of Cationic Finishing Agents," in the Sept. 1, 1941, issue of *American Dyestuff Reporter*. Article outlines properties

and uses of three principal types of cationic finishing agents, explains current theory of their action, gives statistics on their growing consumption in textile industry. It is of particular interest to textile chemists and finishers.

• EFFECTIVENESS of various chemical treatments in preventing mildew growth and the effect of such treatments on the tensile strength of unbleached cotton duck are discussed by Margaret S. Furry and Helen M. Robinson, of the U. S. Bureau of Home Economics, in the Sept. 29, 1941, issue of *American Dyestuff Reporter*. Report discusses in detail results obtained with 32 different treatments.

• WHY UNDAMAGED WOOL is resistant to attack by enzymes and wool damaged by mechanical means is susceptible to attack by enzymes are discussed in a report "Nature of Resistance of Wool to Digestion by Enzymes," in the November, 1941, issue of the *Journal of Research*. This report by Walton B. Geiger, W. I. Patterson, L. R. Mizell, and Milton Harris covers one phase of the research on wool sponsored by the Textile Foundation; it is of chief interest to research workers.

• A NEW METHOD for determining the extent to which cellulosic materials have been degraded by acids is described in a report, "Estimation of Aldehyde Groups in Hydro-Cellulose from Cotton," in the November, 1941, issue of the *Journal of Research*. This report by A. R. Mertin, Leonard Smith, R. L. Whistler, and Milton Harris, covers one phase of the fundamental research sponsored by the Textile Foundation; it is of chief interest to research workers.